

ABSTRACT

This invention discloses a configuration of thin-film membrane. This thin-film membrane is freestanding, movable, and made of multiple layers of different materials such as silicon nitride, polycrystalline silicon or the combination of these two. This thin-film membrane can be actuated by external controlling forces such as electrostatic force. This thin-film membrane consists of odd number of layers, e.g., 1 layer, 3 layers, 5 layers, ..., etc. Moreover, the layer profile of this membrane is symmetric, e.g., the bottommost layer is made to be identical to the topmost layer, the next bottommost layer is made to be identical to the next topmost layer, so on and so forth.